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20 Be it known that I, Alan J. Dabbieri, a citizen of the United States of
America, residing at 734 Heard's Ferry Road, Atlanta, GA 30328, have conceived
an invention entitled:

METHODS AND DEVICES UTILIZING A TRACKING SYSTEM

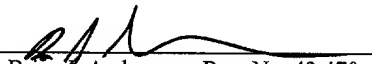
of which the following is a specification:

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I hereby certify under 37 C.F.R. § 1.10 that this correspondence is being deposited with the United States Postal Service with sufficient postage for Express Mail, Mailing No. EL5412895705US in an envelope addressed to: Assistant Commissioner of Patents & Trademarks, **BOX CONTINUING PATENT APPLICATION**, Washington, DC 20231, on December 8, 2000.


Brian J. Anderson – Reg. No. 43,470

METHODS AND DEVICES UTILIZING A TRACKING SYSTEM

CROSS REFERENCE TO RELATED APPLICATIONS

The following U. S. Patent Application claims priority under 35 U. S.C. §120 based upon the application entitled Methods and Devices for Utilizing a GPS Tracking System with
5 serial number 08/563,265 filed on November 27,1995 naming Alan J. Dabbieri as inventor.

TECHNICAL FIELD

The present invention relates to devices and methods for tracking movement of moving objects such as people and equipment to track and determine productivity in a warehouse or the like, employing global positioning system (GPS). The present invention
10 also relates to a devices and methods of tracking the activities (such as assigned tasks) of people to track and determine productivity in a warehouse or the like, employing a GPS. The present invention also relates to devices and methods of providing improved security and/or visitor tracking.

BACKGROUND OF THE INVENTION

15 People normally perform specific tasks as directed by supervisor personnel in a warehouse setting. In a more modern warehouse, such tasks are computer-generated. Productivity, especially employee productivity is determined by analyzing the tasks performed over time. There are limitations to the various aspects of these methods. There is a great need for a way to obtain precise information regarding movement, activity and current
20 location of individuals and/or equipment and utilize such information to improve the warehouse efficiency.

SUMMARY OF THE INVENTION

The system of the present invention will gather exact time, activity and position information of an employee over a period of each work day and the task being worked on at
25 that moment. These data can be analyzed to determine, for example, non-productive movements, and provide a better foundation of information for productivity payroll including the relative 'difficulty' of a task.

It is therefore an object of the present invention to provide a method to track movement and activity of objects and individuals to analyze methods for improvement and
30 creation of improved methods resulting from this tracking. It is a further object of the present

invention to provide a method to graphically recreate position and activity over a period of time (in faster or slower than actual time) for analysis and review purposes. It is still a further object of the present invention to provide a method to track equipment movement to better determine repair/maintenance intervals. It is still a further object of the present invention to provide a method to use such data to perform more sophisticated incentive pay capabilities in an incentive pay environment. It is still a further object of the present invention to provide a method to use such data to provide improved security and safety policies and the like and to track and enforce such policies.

The method of tracking movement of a moving object to track and determine productivity of the present invention comprises the steps of: receiving a current position of said object via a global positioning system (GPS) signal; obtaining data including the current position and activity of the object; repeating the receiving and obtaining steps for a period of time to create positional movements and the activities for the period of time; overlaying the positional movements and the activities on a two or three dimensional map for the period of time; analyzing the positional movements and the activities of the map for the period of time; and determining the productivity of the object from the analyzed positional movements and the activities.

The method of the present invention includes the steps of: determining difficulty of the activities from the analyzed activities; and determining pay incentives. Additionally, the method includes determining non-productive movements and assigning the object to a next task based on the current position.

The method of the present invention further includes the steps of: learning a best method of performing the activities in an operation; and creating a computer simulation model identifying or predicting the best method based on a past performance of the operation.

The system of tracking movement of moving objects of the present invention includes: a plurality of devices, each device being associated with a respective moving object and adapted to receive a current position via a global positioning system (GPS) signal and transmit data including the current position and an activity of the object; and a host computer obtaining the data for a period of time to create positional movements and activities of the object for the period of time and overlaying the positional movements and the activities on a

two or three dimensional map for the period of time for the basis of determining the productivity of the object from the positional movements and the activities.

The devices are selected from the set of a portable data terminal and a badge wherein the portable data terminal and the badge comprise: a radio frequency transmitter to transmit the data; and, a global positioning system (GPS) receiver.

The system of the present invention further includes: means for learning a best method of performing the activities in an operation; and means for creating a computer simulation model identifying or predicting a best method based on a past performance of the operation.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 illustrates the system of the present invention including a portable data terminal.

FIG. 2 illustrates the system of the present invention including a security badge.

FIG. 3 illustrates the method of the present invention.

DESCRIPTION OF THE INVENTION

Referring now to **FIG. 3**, the current ability to track productivity includes summarization of 'tasks performed' for productivity analysis (Step 108). With the improved tracking capabilities provided using a global positioning system (hereinafter 'GPS'), a complete reconstruction (graphically if desired by overlaying the positional movements on a 2 or 3 dimensional map of the location) of a series movements over a period of time can be analyzed (Step 106).

Referring also to **FIG. 1**, the system 10 of the present invention will gather exact time and position information of an employee over a period of each work day and the task being worked on at any given moment of time (Step 102). These data can be analyzed to determine, for example, non-productive movements, and provide a better foundation of information for productivity payroll including the relative 'difficulty' of a task (Step 122). It is envisioned that this method 100 can be used in a warehouse, office or any location where there is a need to determine information such as productivity of an individual or equipment (Step 108). It is further envisioned that such a method 100 can be used to track the identity and location of visitors and/or employees around a particular site.

In addition to the analysis of this information for productivity tracking and methods analysis, this information could be used for security tracking (Step 112) if the individual is entering areas of the building that are not required to fulfill the requirements of the tasks assigned, or if safety issues arise.

5 The system 10 can be integrated into a neural network of information that could 'learn' the best methods of performing tasks to create computer simulation models that identify or predict better operations by collecting and analyzing a stream of data regarding past performance.

10 This method 100 has the ability to track the movement of objects and individuals to analyze methods for improvement and creation of improved methods and to graphically recreate position and activity over a period of time (in faster or slower than actual time) for analysis and review purposes (Step 104). This method 100 also provides the ability to track equipment movement to better determine repair/maintenance intervals (Step 116) and to use data to perform more sophisticated incentive pay capabilities (Step 120) in an incentive pay
15 environment. This method 100 also provides the ability to analyze movement data for security, safety, and adherence to policy purposes (Step 118) and to constantly monitor the current position of equipment and employees in the warehouse to provide a better source of data for assignment of each next task to the equipment/employee in an automated warehouse environment where the warehouse management system assigns each task to each employee
20 (Step 110).

 The proposed device integrates the devices and the functionalities of a basic portable data terminal 18 (radio frequency or batch mode) and a GPS location identification system 16.

25 The portable data terminal 18 functions typically include data collection through key entry 26 or an integrated bar coding scanner 28, execute programs through the use of an internal CPU 24, store data through internal computer memory 22 and/or disk storage, export collected data, and execute/transmit data from an external computer through radio-frequency communications via transmitter 20. Suitable examples of handheld devices incorporating these functions are fully described in U. S. Patent 4,621,189 to Kumar et al., issued
30 November 4, 1986, which is incorporated herein by reference.

The combined device would have the standard capabilities to direct employees to tasks, and collect and transmit data to a host computer 14, or act as a computer terminal for programs executing on the host and would in addition transmit position data to the host computer 14 at specific time intervals.

5 This improvement of the existing capability of the devices is that the constant information of location of the device would be used by the host computer 14 to provide better employee tracking capabilities, and assignment of tasks to the individual which is not currently possible.

10 Referring now to FIG. 2, device 40 integrates any standard employee/visitor security badge 42 with a GPS location sensor 46 and transmitter 50 or data collection device. The purpose of device 40 is to provide better tracking and security enforcement (Step 114) capabilities. Current existing system relies on door locks and visual restrictions. The device 40 would collect data that would provide for a complete tracking means and a historic record of the traveled locations.

15 It is envisioned that an employee will wear (or carry) a device 40 that contains a GPS sensor 46 that will track the latitude, longitude and altitude of the individual, and that this device 40 will have the capacity to either store the collected data, or transmit the data (via, for example, radio frequency) to a host computer 14 that will collect and store the data. Once the data has been collected, it will be analyzed by a separate process to achieve the desired
20 objective such as those described above.